

NASA TECH BRIEF



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Small Hydraulic Turbine Drives

An applied research program has been initiated to study the feasibility and performance of a small hydraulic turbine as a pump inducer drive. This turbine, driven by the fluid being pumped, requires no external controls, is completely integrated into the flow system, and has bearings which utilize the main fluid for lubrication and cooling. Basically, a hydraulic turbine has been designed by methods used for aerospace gas turbines, but with the simplified condition of incompressible flow. Since an important number of gas turbine design criteria (optimized blade geometry, effect of tip clearance, Reynolds number effects, etc.) had been obtained for incompressible fluids, these criteria were available and directly applicable to axial hydraulic turbines. This research program included the design, analysis, optimization, fabrication, and testing of the low speed pump inducer driven by the hydraulic turbine.

The results of testing showed close correlation between predicted and experimental performance. Program restraints, however, restricted the range of the steady state experimental data, and only the immediate neighborhood of the design point was evaluated.

The torque capabilities of this turbine compare favorably with those developed by positive displacement hydraulic motors. The three-stage turbine is very efficient, low-weight, compact, and simple drive.

Small hydraulic turbines appear promising for several industrial applications. They are easily adjustable to any given duty, require little if any maintenance, and are mechanically simple. If manufactured

in commercial quantities with proven techniques, they should be low in cost and reliable in service. The turbines are powerful, of lightweight construction, are entirely rotary, and have no sliding parts. They should be suitable for many processes in which heavy and large hydraulic motors are presently being used.

Notes:

1. The following documentation may be obtained from:

Technical Information Service
American Institute of Aeronautics
and Astronautics, Inc.
750 Third Avenue
New York, New York 10017
Single document price \$3.00
(or microfiche \$0.50)

Reference:

NASA-TM-X-52661 (A70-15640),
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2. Technical questions may be directed to:

Technology Utilization Officer
Lewis Research Center
21000 Brookpark Road
Cleveland, Ohio 44135
Reference: B70-10416

Patent status:

No patent action is contemplated by NASA.

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